

Evidence of Cost Behavior in Iranian Firms

Mohammad Hossein Ghaemi¹, Masoumeh Nematollahi^{2,+}

¹Imam Khomeini International University

²Department of Accounting, Firoozabad Branch, Islamic Azad University, Firoozabad, Iran

Abstract. Conventional cost accounting assumes that the relation between cost and volume is symmetric for volume increases and decreases. We test an alternative model where costs increase more when activity rises than they decrease when Activity falls by an equivalent amount. We find, for a sample of Iranian firms that direct material cost increase 0.43% per 1% increase in sales but decrease 0.70% per 1% decrease in sales, direct labor cost increase 0.183% per 1% increase in sales but decrease only 0.09% per 1% decrease in sales, and overhead cost increase 0.328% per 1% increase in sales but decrease only 0.13% per 1% decrease in sales. And we confirm cost stickiness for overhead costs and direct labor costs in Iranian firms, but direct material costs are not sticky in Iranian firms.

Keywords: direct labor cost, direct material cost, overhead costs, sales, cost stickiness.

1. Introduction

Traditional cost behavior models in the accounting literature distinguish between fixed and variable costs with respect to changes in the level of activity. Fixed costs are assumed to be independent of the level of activity whereas variable costs are assumed to change linearly and proportionately to changes in the level of activity. Underlying the traditional cost behavior model are a number of assumptions which, apart from simplifying the real world, distance the model from the way costs behave in reality.(K.calleja and others.2005)

However, some authors have sustained costs rise more with increases in activity volume than they fall with decreases (Cooper and Kaplan, 1998, p. 247; Noreen and Sanderstrom, 1997). This kind of cost behavior is called by Anderson, Banker and Janakiraman (2003) “sticky costs”.

Such sticky cost behavior arises if trimming off excess resources when demand declines are relatively more costly than scaling up resources to accommodate increased demand. Under such conditions, managers’ rational resource adjustment decision entails less reduction of resources when sales decrease than addition of resources when sales increase (Anderson et al. 2003).

2. Review and Hypotheses

Noreen (1991) demonstrates that cost allocation – even in ABC – is relevant for the decisions if, and only if, the following conditions are satisfied: 1) all costs can be divided in centers and each one is defined as a function of a measured activity; 2) the cost amount in each cost center changes in direct proportion to its activity; and 3) all activities can be attributed to products in the sense that if a product is cut, then the activities associated to this product will be eliminated. Anderson et al. (2003) document that costs are sticky in that they decrease less with a sales decrease than they increase with a sales increase. Although Noreen and Soderstrom (1997) find no evidence of stickiness, Anderson, Banker and Janakiraman (2003) find that

+ Corresponding author. Tel.: + 009809177139161; fax: +009807126224402.
E-mail address: massoomeh.nematollahi@gmail.com

selling, general and administrative costs are sticky and increase, on average, by 0.55% per 1% increase in revenues, but decrease only 0.35% per 1% decrease in revenues. Subramanian and Weidenmier (2003) confirm cost stickiness, finding that total costs increase 0.93% per 1% increase in revenues but decrease by 0.85% per 1% decrease. Both Anderson *et al.* (2003) and Subramanian and Weidenmier (2003) also find that the level of stickiness is influenced by economic conditions and by firm characteristics. Medeiros and Costa (2005) find, for a sample of Brazilian firms that selling, general, and administrative costs increase 0.59% per 1% increase in sales but decrease only 0.32% per 1% decrease in sales.

The strongest evidence of sticky behavior is found in samples consisting of firms from multiple industries, while samples from one industry (Noreen and Soderstrom, 1994, 1997) exhibit limited sticky cost behavior. Prior research shows that each industry operates in a different production environment causing accounting variables to be industry specific, making the relationship of costs to activity changes industry-specific (Ely, 1991).

2.1 Hypotheses

In connection with the asymmetric cost behavior three hypotheses are tested in this study, as follows:

H1: the magnitude of direct material costs increase as function of an increase in net sales revenues is greater than the magnitude of direct material costs reduction as function of an equivalent reduction in net sales revenues.

H2: the magnitude of direct labor costs increase as a function of an increase in net sales revenues is greater than the magnitude of direct labor costs reduction as a function of an equivalent reduction in net sales revenues.

H3: the magnitude of an overhead costs increase as a function of an increase in net sales revenues is greater than the magnitude of an overhead costs reduction as a function of an equivalent reduction in net sales revenues.

Hypothesis H1, H2 and H3 considers how the managerial intervention affects the process of resource adjustment. Managers make discrete changes in committed resources because some corresponding costs cannot be added or reduced fast enough to combine changes in resources with small changes in demand.

3. Sample Selection

The dataset comprises Iranian listed companies with at least four consecutive years of accounting data during the period 2000 to 2003. We exclude financial companies due to the unavailability of standardized accounting data. Annual data for revenues and direct material costs, direct labor costs and overhead costs for each of the companies are found from Tehran stock exchange library. Final sample comprises 82 companies with a total of 328 firm-years.

4. Research Methodologies

In this section we outline the models used to test the hypotheses outlined in Section 2. We test for cost stickiness of firms using the following model:

$$\log [\text{total costs}_{i,t} / \text{total costs}_{i,t-1}] = \alpha + \beta_1 * \log [\text{revenue}_{i,t} / \text{revenue}_{i,t-1}] + \beta_2 * \text{decrease}_{i,t} * \log [\text{revenue}_{i,t} / \text{revenue}_{i,t-1}] + \varepsilon_{i,t}$$

The variable *decrease* (*d*) is a dummy variable that takes the value of 1 when revenue decreases between two periods, and is otherwise 0.

The use of the log model is consistent with previous studies (Anderson *et al.* (2003), Subramaniam & Weidenmier (2003)). Since the value of the *decrease* variable (*d*) is 0 when revenue increases, β_1 measures the increase in percentage terms in costs with a 1% increase in revenue. On the other hand, since the value of *decrease* is 1 when revenue decreases, the sum of β_1 and β_2 measures the decrease in percentage terms in costs following a 1% decrease in revenue. If the traditional cost behavior model is valid, β_2 would be equal to 0 since upward and downward changes in costs will be equal, and β_1 would be equal to 1, reflecting proportionality. If companies exhibit sticky cost behavior, β_2 will be negative and statistically significant.

4.1 Empirical Procedures

The data used in our study are arranged as a pooled (across firms) regression model for each year, and then we took the average of annually regression coefficients, because to measure cost stickiness we need decrease and increase of revenue in our sample, but in pool of Iranian firms we have alone increase of revenue ,and in each year maybe we have decrease of revenue too, in our sample firms .each model are used for each year, and then we took an average from regression coefficients .The regressions are carried out using SPSS Version 14.

5. Empirical Findings

The empirical findings on each of the hypotheses are set out below.

5.1 Direct Material Costs Stickiness

Table 1 presents the results for the full sample of companies.

Table 1 Direct material costs stickiness						
$\log [\text{total costs } i,t / \text{total costs } i,t-1] = \alpha + \beta_1 * \log [\text{revenue } i,t / \text{revenue } i,t-1] + \beta_2 * \text{decrease } i,t * \log [\text{revenue } i,t / \text{revenue } i,t-1] + \varepsilon i,t$ <p>The variable <i>decrease</i> (<i>d</i>) is a dummy variable that takes the value of 1 when revenue decreases, and is otherwise 0.</p>						
year	p.value	α	β_1	β_2	R ²	Adj.R ²
2000	0	.039 (3.105)	.71 (9.872)	-.072 (-.355)	.6	.63
2001	0	.044 (2.717)	.11 (1.12)	1.222 (5.008)	.4	.41
2002	0	.015 (.712)	.777 (4.536)	-.95 (-4.441)	.2	.2
2003	.014	.097 (8.299)	.12 (2.362)	.074 (.506)	.1	.09

Regression results using 328 firm-years for Iranian companies. Separate regressions are run for each year and 82 companies. T-stats are shown in parentheses below the estimated regression coefficients.

The estimated values of β_1 range from 0.777 (for year 2002 listed companies) to 0.11 (for year 2001 listed companies), implying that total material costs increase, on average, by around 0.43% per 1% increase in revenue (average of β_1 in each year) . Across all companies in the sample, β_2 averages 0.27; when revenue decreases by 1%, total material costs decrease by around 0.70% (0.43 + 0.27). This confirms that changes in total material costs are not sticky.

5.2 Direct labor Cost Stickiness

Table 2 presents the results for the full sample of companies.

Table 2 Direct labor cost stickiness						
$\log [\text{total costs } i,t / \text{total costs } i,t-1] = \alpha + \beta_1 * \log [\text{revenue } i,t / \text{revenue } i,t-1] + \beta_2 * \text{decrease } i,t * \log [\text{revenue } i,t / \text{revenue } i,t-1] + \varepsilon i,t$ <p>The variable <i>decrease</i> (<i>d</i>) is a dummy variable that takes the value of 1 when revenue decreases, and is otherwise 0.</p>						
Year	p.value	A	β_1	β_2	R ²	Adj.R ²
2000	0	.083 (8.556)	.23 (4.175)	-.015 (-1.004)	.6	.19
2001	0	.09 (7.551)	.03 (.447)	.536 (3.089)	.4	.18
2002	.002	.064 (5.748)	.355 (3.539)	-.35 (-2.919)	.2	.14
2003	.048	.049 (4.025)	.12 (2.423)	-.258 (-1.658)	.1	.05

Regression results using 328 firm-years for Iranian companies. Separate regressions are run for each year and 82 companies. T-stats are shown in parentheses below the estimated regression coefficients.

The estimated values of β_1 range from 0.355 (for year 2002 listed companies) to 0.03 (for year 2001 listed companies), implying that total direct labor cost increase, on average, by around 0.183% per 1% increase in revenue (average of β_1 in each year). Across all companies in the sample, β_2 averages -.093; when revenue decreases by 1%, total direct labor costs decrease by around 0.09% (0.183- 0.093). This confirms that changes in total direct labor costs are sticky.

5.3 Overhead Costs Stickiness

Table 3 presents the results for the full sample of companies.

Table 3 Overhead costs stickiness						
$\log [\text{total costs}_{i,t} / \text{total costs}_{i,t-1}] = \alpha + \beta_1 * \log [\text{revenue}_{i,t} / \text{revenue}_{i,t-1}] + \beta_2 * \text{decrease}_{i,t} * \log [\text{revenue}_{i,t} / \text{revenue}_{i,t-1}] + \varepsilon_{i,t}$ <p>The variable <i>decrease</i> (<i>d</i>) is a dummy variable that takes the value of 1 when revenue decreases, and is otherwise 0.</p>						
Year	p.value	α	β_1	β_2	R ²	Adj.R ²
2000	0	.036 (3.568)	.46 (8.287)	-.55 (-3.458)	.5	.48
2001	0	.07 (7.456)	.038 (.6)	.66 (4.323)	.3	.33
2002	0	.024 (2.109)	.55 (3.368)	-.55 (-4.332)	.3	.29
2003	0	.038 (4.403)	.26 (6.705)	-.35 (-3.211)	.4	.38

Regression results using 328 firm-years for Iranian companies. Separate regressions are run for each year and 82 companies. T-stats are shown in parentheses below the estimated regression coefficients.

The estimated values of β_1 range from 0.55 (for year 2002 listed companies) to 0.26 (for year 2003 listed companies), implying that total overhead costs increase, on average, by around 0.33% per 1% increase in revenue (average of β_1 in each year). Across all companies in the sample, β_2 averages -0.2; when revenue decreases by 1%, total overhead costs decrease by around 0.13% (0.33- 0.2). This confirms that changes in total overhead costs are sticky.

6. Conclusion

Our findings suggest that total material costs are not sticky; averaged across all the firms in our sample, direct labor costs increase by 0.19% per 1% increase in revenue, but decrease by only 0.09% per 1% decrease in revenue, and overhead costs increase by 0.33% per 1% increase in revenue, but decrease by 0.13% per 1% decrease in revenue, then direct labor costs and overhead costs are sticky. Our results are consistent with an alternative cost behavior model that takes into account the asymmetric friction created by managers when adjusting committed resources following changes in the level of activity of the firm. The results have implications for managers and corporate decision makers. Decisions based on the traditional cost behavior model will overestimate or underestimate the responsiveness of costs to changes in the level of activity.

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